WEST Search History

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DATE: Thursday, April 01, 2004

Hide?	Set Name	Query	Hit Count
		DB=USPT,PGPB; PLUR=YES; OP=ADJ	
☐	L10	L9 and L7	1
☐	L9	L8 and (barley or arabidopsis or oryza)	7
☐	L8	nicotianamine synthase	7
☐	L7	L6 or L5 or L4 or L3 or L2 or L1	18086
☐	L6	(((800/320.2)!.CCLS.))	264
☐	L5	(((800/320)!.CCLS.))	303
☐	L4	(((800/295)!.CCLS.))	455
☐	L3	(((530/350)!.CCLS.))	13722
☐	L2	(((435/193)!.CCLS.))	1508
☐	L1	((435/183)!.CCLS.)	4455

END OF SEARCH HISTORY

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=> d his

     (FILE 'HOME' ENTERED AT 13:56:19 ON 01 APR 2004)

     FILE 'REGISTRY' ENTERED AT 13:56:42 ON 01 APR 2004
L1             1 S NICOTIANAMINE SYNTHASE/CN

     FILE 'HCAPLUS' ENTERED AT 13:57:18 ON 01 APR 2004

     FILE 'REGISTRY' ENTERED AT 13:57:21 ON 01 APR 2004
                SET SMARTSELECT ON
L2           SEL L1 1- CHEM :       2 TERMS
                SET SMARTSELECT OFF

     FILE 'HCAPLUS' ENTERED AT 13:57:22 ON 01 APR 2004
L3            37 S L2
L4            25 S L3 (L) (BARLEY OR ARABIDOPSIS OR ORYZA)
L5            10 S L4 AND PD<19990430
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=> d ibib ab 1-10

L5 ANSWER 1 OF 10 HCAPLUS COPYRIGHT 2004 ACS on STN
ACCESSION NUMBER: 2000:40345 HCAPLUS
DOCUMENT NUMBER: 133:54316
TITLE: Cloning of **nicotianamine synthase** genes from **Arabidopsis** thaliana
AUTHOR(S): Suzuki, Kazuya; Higuchi, Kyoko; Nakanishi, Hiromi; Nishizawa, Naoko K.; Mori, Satoshi
CORPORATE SOURCE: CREST, Japan Science and Technology Corporation (JST), Tsukuba, 305-0047, Japan
SOURCE: Soil Science and Plant Nutrition (Tokyo) (**1999**), 45(4), 993-1002
CODEN: SSPNAW; ISSN: 0038-0768
PUBLISHER: Japanese Society of Soil Science and Plant Nutrition
DOCUMENT TYPE: Journal
LANGUAGE: English
AB **Nicotianamine synthase** (NAS) catalyzes the trimerization of S-adenosylmethionine to form one mol. of nicotianamine (NA). In order to identify the gene encoding NAS in dicotyledonous plants, **Arabidopsis** thaliana databases were searched using the nucleotide sequence of the NAS gene from **barley** (HvNAS), which was recently isolated. Several ESTs and 3 genomic sequences highly homologous to HvNAS were found in the databases. Based on these nucleotide sequences and that of HvNAS, 2 sets of primers were designed to isolate the NAS orthologs in **Arabidopsis** and 3 DNA clones encoding AtNAS (AtNAS1, 2, and 3) were obtained. These clones were expressed in Escherichia coli and their protein products displayed the NAS activity. The expression of AtNAS1 was detected in both shoots and roots of A. thaliana by RT-PCR; AtNAS3 expression was only detected in the shoots. In contrast, AtNAS2 expression was not detected in any organs.
REFERENCE COUNT: 40 THERE ARE 40 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L5 ANSWER 2 OF 10 HCAPLUS COPYRIGHT 2004 ACS on STN
ACCESSION NUMBER: 1999:656714 HCAPLUS
DOCUMENT NUMBER: 132:10326
TITLE: Isolation, characterization and cDNA cloning of **nicotianamine synthase** from **barley**. A key enzyme for iron homeostasis in plants
AUTHOR(S): Herbik, A.; Koch, G.; Mock, H.-P.; Dushkov, D.; Czihal, A.; Thielmann, J.; Stephan, U. W.; Baumlein, H.
CORPORATE SOURCE: Institut fur Pflanzengenetik und Kulturpflanzenforschung (IPK), Gatersleben, D-06466, Germany
SOURCE: European Journal of Biochemistry (**1999**), 265(1), 231-239
CODEN: EJBCAI; ISSN: 0014-2956
PUBLISHER: Blackwell Science Ltd.
DOCUMENT TYPE: Journal
LANGUAGE: English
AB Basic cellular processes such as electron transport in photosynthesis and respiration require the precise control of iron homeostasis. To mobilize iron, plants have evolved at least two different strategies. The nonproteinogenous amino acid nicotianamine which is synthesized from three mols. of S-adenosyl-L-methionine, is an essential component of both pathways. This compound is missing in the tomato mutant chloronerva, which exhibits severe defects in the regulation of iron metabolism We report the purification and partial characterization of the **nicotianamine synthase** from **barley** roots as well as the cloning of two corresponding gene sequences. The function of the gene sequence has been verified by overexpression in Escherichia coli. Further confirmation comes from reduction of the nicotianamine content and the exhibition of a chloronerva-like phenotype due to the expression of heterologous antisense constructs in transgenic tobacco plants. The native enzyme with an apparent Mr of ≈ 105 000 probably represents a trimer of S-adenosyl-L-methionine-binding subunits. A comparison with the recently

cloned chloronerva gene of tomato reveals striking sequence homol., providing support for the suggestion that the destruction of the **nicotianamine synthase** encoding gene is the mol. basis of the tomato mutation.

REFERENCE COUNT: 38 THERE ARE 38 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L5 ANSWER 3 OF 10 HCAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 1999:647368 HCAPLUS

DOCUMENT NUMBER: 132:76041

TITLE: Presence of nicotianamine synthase isozymes and their homologues in the root of graminaceous plants

AUTHOR(S): Higuchi, Kyoko; Nakanishi, Hiromi; Suzuki, Kazuya; Nishizawa, Naoko K.; Mori, Satoshi

CORPORATE SOURCE: Laboratory of Plant Molecular Physiology, Department of Applied Biological Chemistry, The University of Tokyo, Tokyo, 113-8657, Japan

SOURCE: Soil Science and Plant Nutrition (Tokyo) (**1999**), 45(3), 681-691
CODEN: SSPNAW; ISSN: 0038-0768

PUBLISHER: Japanese Society of Soil Science and Plant Nutrition

DOCUMENT TYPE: Journal

LANGUAGE: English

AB **Nicotianamine synthase** (NAS) catalyzes the synthesis of nicotianamine, which is an intermediate in the biosynthetic pathway of mugineic acid family phytosiderophores (MAs). Using polyclonal anti-NAS antibodies and recombinant NAS proteins, five NAS isoenzymes and one NAS homolog were identified in Fe-deficient **barley** roots using two-dimensional electrophoresis followed by Western blot anal. Other unidentified NAS homologues that were induced by Fe-deficiency were also detected in **barley** roots. Western anal. enabled to detect NAS homologues in wheat, oats, rice, maize, and sorghum roots. In graminaceous species, both the amount and number of NAS homologues were correlated with the total NAS activity and Fe-deficiency tolerance. The NAS isoform patterns differed among the graminaceous plants.

REFERENCE COUNT: 15 THERE ARE 15 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L5 ANSWER 4 OF 10 HCAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 1999:461782 HCAPLUS

DOCUMENT NUMBER: 131:209894

TITLE: Map-based cloning of chloronerva, a gene involved in iron uptake of higher plants encoding nicotianamine synthase

AUTHOR(S): Ling, Hong-Qing; Koch, Gudrun; Baumlein, Helmut; Ganal, Martin W.

CORPORATE SOURCE: Institute for Plant Genetics and Crop Plant Research, Gatersleben, D-06466, Germany

SOURCE: Proceedings of the National Academy of Sciences of the United States of America (**1999**), 96(12), 7098-7103
CODEN: PNASA6; ISSN: 0027-8424

PUBLISHER: National Academy of Sciences

DOCUMENT TYPE: Journal

LANGUAGE: English

AB The uptake of iron in plants is a highly regulated process that is induced on iron starvation. In tomato, the mutant chloronerva exhibits constitutive expression of iron uptake responses and intercostal chlorosis. Biochem., chloronerva is an auxotroph for nicotianamine, a key polyamine in plant iron uptake metabolism The chloronerva gene has been fine-mapped onto the long arm of chromosome 1 in a large segregating tomato population and yeast artificial chromosome clones encompassing the region were isolated by using flanking markers. A cosmid contig containing the chloronerva gene was established, and complementing cosmids were identified by transformation into the mutant. The chloronerva transcript was identified by cDNA isolation using the complementing cosmids. The gene encodes a unique protein of 35 kDa. The mutant harbors a single base change compared with the wild type. Based on enzyme activity and sequence similarity to the coding DNA sequence of the purified **barley**

• enzyme the chloronerva gene encodes the enzyme **nicotianamine synthase**.

REFERENCE COUNT: 27 THERE ARE 27 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L5 ANSWER 5 OF 10 HCAPLUS COPYRIGHT 2004 ACS on STN
ACCESSION NUMBER: 1999:424322 HCAPLUS
DOCUMENT NUMBER: 131:226058
TITLE: Iron acquisition by plants
AUTHOR(S): Mori, Satoshi
CORPORATE SOURCE: Laboratory of Plant Molecular Physiology, Department of Applied Biological Chemistry, The University of Tokyo, Tokyo, 113-8657, Japan
SOURCE: Current Opinion in Plant Biology (**1999**), 2(3), 250-253
CODEN: COPBFZ; ISSN: 1369-5266
PUBLISHER: Current Biology Publications
DOCUMENT TYPE: Journal; General Review
LANGUAGE: English
AB A review with 33 refs. In nongraminaceous plants, the FeII-transporter gene and ferric-chelate reductase gene have been cloned from **Arabidopsis** thaliana, whereas FeIII-reductase has not. In graminaceous monocots, the genes for mugineic acids (MAs) synthesis, nas (**nicotianamine synthase**) and naat (nicotianamine aminotransferase), have been cloned from **barley**, whereas the FeIII-MAs transporter gene is yet to be cloned. Transferrin absorption in Dunaliella has been reported, suggesting a phagocytotic (endocytotic) Fe-acquisition mechanism. Work to develop transgenic cultivars tolerant to Fe-deficiency in calcareous soils is now in progress.
REFERENCE COUNT: 33 THERE ARE 33 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L5 ANSWER 6 OF 10 HCAPLUS COPYRIGHT 2004 ACS on STN
ACCESSION NUMBER: 1999:150695 HCAPLUS
DOCUMENT NUMBER: 131:1306
TITLE: Cloning of nicotianamine synthase genes, novel genes involved in the biosynthesis of phytosiderophores
AUTHOR(S): Higuchi, Kyoko; Suzuki, Kazuya; Nakanishi, Hiromi; Yamaguchi, Hirotaka; Nishizawa, Naoko-Kishi; Mori, Satoshi
CORPORATE SOURCE: Laboratory of Plant Molecular Physiology, Department of Applied Biological Chemistry, The University of Tokyo, Tokyo, 113-8657, Japan
SOURCE: Plant Physiology (**1999**), 119(2), 471-479
CODEN: PLPHAY; ISSN: 0032-0889
PUBLISHER: American Society of Plant Physiologists
DOCUMENT TYPE: Journal
LANGUAGE: English
AB **Nicotianamine synthase** (NAS), the key enzyme in the biosynthetic pathway for the mugineic acid family of phytosiderophores, catalyzes the trimerization of S-adenosylmethionine to form one mol. of nicotianamine. The authors purified NAS protein and isolated the genes nas1, nas2, nas3, nas4, nas5-1, nas5-2, and nas6, which encode NAS and NAS-like proteins from Fe-deficient **barley** (Hordeum vulgare L. cv Ehimehadaka number 1) roots. Escherichia coli expressing nas1 showed NAS activity, confirming that this gene encodes a functional NAS. Expression of nas genes as determined by northern-blot anal. was induced by Fe deficiency and was root specific. The NAS genes form a multigene family in the **barley** and rice genomes.
REFERENCE COUNT: 36 THERE ARE 36 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L5 ANSWER 7 OF 10 HCAPLUS COPYRIGHT 2004 ACS on STN
ACCESSION NUMBER: 1996:586037 HCAPLUS
DOCUMENT NUMBER: 125:239625
TITLE: A strategy for cloning the genes in the synthetic pathway of mugineic acid-family phytosiderophores
AUTHOR(S): Mori, S.
CORPORATE SOURCE: Faculty Agriculture, University Tokyo, Tokyo, 113,

Japan
SOURCE: Genetic Manipulation of Crop Plants to Enhance Integrated Nutrient Management in Cropping Systems--1. Phosphorus, Proceedings ofan FAO-ICRISAT Expert Consultancy Workshop, Patancheru, India, Mar. 15-18, 1994 (**1995**), Meeting Date 1994, 129-144. Editor(s): Johansen, C. International Crops Research Institute for the Semi-Arid Tropics: Patancheru, India.
CODEN: 63KAAB
DOCUMENT TYPE: Conference
LANGUAGE: English
AB Genes involved in the biosynthetic pathway of mugineic acid-family phytosiderophores were cloned. Initially, the genes for **nicotianamine synthase** and nicotianamine aminotransferase were confirmed to be induced by iron (Fe) deficiency and were partially purified. The partial amino acid sequences of the "d" peptide were determined on 2D-PAGE, which appeared to be specific to Fe-deficient **barley** roots. Finally, seven Fe-deficiency specific clones were selected by "differential screening" of a cDNA library constructed from Fe-deficient **barley** roots and three DNA clones (Ids1, Ids2, and Ids3) were sequenced from amongst these. Strategies to clone the genes essential for the synthesis of phytosiderophores are discussed.

L5 ANSWER 8 OF 10 HCAPLUS COPYRIGHT 2004 ACS on STN
ACCESSION NUMBER: 1996:202215 HCAPLUS
DOCUMENT NUMBER: 124:259698
TITLE: The role of nicotianamine synthase in response to Fe nutrition status in Gramineae
AUTHOR(S): Higuchi, Kyoko; Kanazawa, Kenji; Nishizawa, Naoko-Kishi; Mori, Satoshi
CORPORATE SOURCE: Dep. Appl. Biol. Chem., Univ. Tokyo, TOkyo, 113, Japan
SOURCE: Plant and Soil (**1996**), 178(2), 171-7
CODEN: PLSOA2; ISSN: 0032-079X
PUBLISHER: Kluwer
DOCUMENT TYPE: Journal
LANGUAGE: English
AB Nicotianamine is an intermediate for the biosynthesis of mugineic acid-family phytosiderophores (MAs) in the Gramineae and a key substance for iron metabolism in dicots. **Nicotianamine synthase** catalyzes the formation of nicotianamine from S-adenosylmethionine. **Nicotianamine synthase** activity was induced in **barley** roots at the 3rd day after withholding Fe supply and declined within one day following the supply of Fe3+-epihydroxymugineic acid. The induction **nicotianamine synthase** activity by Fe-deficiency was observed also in sorghum, maize, and rye, and the level of **nicotianamine synthase** activity was highly associated with the MAs secreted among graminaceous plant tested. Therefore, the **nicotianamine synthase** gene may be a suitable candidate for making a transgenic plant tolerant to Fe-deficiency.

L5 ANSWER 9 OF 10 HCAPLUS COPYRIGHT 2004 ACS on STN
ACCESSION NUMBER: 1995:771685 HCAPLUS
DOCUMENT NUMBER: 123:165182
TITLE: Response of **nicotianamine synthase** activity to Fe-deficiency in tobacco plants as compared with **barley**
AUTHOR(S): Higuchi, Kiyoko; Nishizawa, Naoko-Kishi; Yamaguchi, Hirotaka; Roemheld, Volker; Marschner, Horst; Mori, Satoshi
CORPORATE SOURCE: Fac. Agric. Agric. Life Sci., Univ. Tokyo, Tokyo, 113, Japan
SOURCE: Journal of Experimental Botany (**1995**), 46(289), 1061-3
CODEN: JEBOA6; ISSN: 0022-0957
PUBLISHER: Oxford University Press
DOCUMENT TYPE: Journal
LANGUAGE: English

AB In vitro **nicotianamine synthase** activity was measured in tobacco under Fe-deficient or Fe-sufficient conditions. Its activity was not induced by Fe-deficiency, in contrast to **barley** roots, implying that the mol. biol. regulation of **nicotianamine synthase** in response to Fe-deficiency may be different between tobacco and **barley**.

L5 ANSWER 10 OF 10 HCAPLUS COPYRIGHT 2004 ACS on STN
ACCESSION NUMBER: 1995:319128 HCAPLUS
DOCUMENT NUMBER: 122:183289
TITLE: Purification and characterization of **nicotianamine synthase** from Fe-deficient **barley** roots
AUTHOR(S): Higuchi, Kyoko; Kanazawa, Kenji; Nishizawa, Naoko-Kishi; Chino, Mitsuo; Mori, Satoshi
CORPORATE SOURCE: Lab. Plant nutrition Fertilizers, Univ. Tokyo, Tokyo, 113, Japan
SOURCE: Plant and Soil (**1994**), 165(2), 173-9
CODEN: PLSOA2; ISSN: 0032-079X
PUBLISHER: Kluwer
DOCUMENT TYPE: Journal
LANGUAGE: English
AB Nicotianamine (NA), the key precursor of the mugineic acid family phytosiderophores (MAs), is synthesized from S-adenosylmethionine (SAM). NA synthase was strongly induced by Fe-deficiency treatment, and the activity increased to the maximum level faster than the time of maximum level of MAs secretion and also before the appearance of severest chlorosis. The enzyme was mainly localized in the roots of barley. NA synthase had an optimum pH at 9.0, a mol. weight of .apprx.40,000-50,000 estimated by gel filtration or .apprx.30,000 by SDS-PAGE. Using hydrophobic chromatog., hydroxylapatite chromatog., and preparative SDS-PAGE, NA synthase was purified as 1 band on SDS-PAGE.